Building Climate Resilience: Fish Passage Design

Background Information on the Fraser River:

The Fraser River starts as a trickle of melted snow at the top of Mount Robson, which is in the Rocky Mountains, sitting on the border of British Columbia and Alberta. The river travels 1,375 kilometres through BC and empties into the Pacific Ocean. There are many tributaries (a river or stream that flows into a larger river or lake) that add water to the Fraser as it travels through BC. The Fraser River is the longest in BC, and one of the largest in all of Canada.

The landscapes of the Fraser River change from the beginning of its journey to its end. As you exit the headwaters on Mount Robson, the water is crystal clear, shallow, and extremely cold. The middle portion of the river is called the Fraser Canyon, where the river is squeezed between mountain ranges, increasing the speed and creating many impressive rapids. The point at which the fresh water of the Fraser River meets the salty water of the Pacific Ocean is called the estuary (also sometimes called "between land" by the First Nations people because, as the tides ebb and flow, the estuary changes from land that is covered with water to dry land). Because estuaries have access to both riparian (river) and marine nutrients, they are home to an incredible diversity of life. The Lower Mainland is located in the estuary portion of the Fraser River.

The Fraser River Estuary is as rich in its biodiversity as it is an ideal habitat for many organisms, such as salmon. Salmon are a keystone species because their life cycle contributes greatly to the health and biodiversity of numerous ecosystems. They transport nutrients found in the ocean to freshwater environments as they migrate inland to spawn. These nutrients can also reach land as their odies wash upon shore, feeding hundreds of other species, from bears and eagles to towering forests and microorganisms. Their populations are an important way for scientists to gauge the health of a watershed, and their decline signals broader ecosystem imbalances.

Indigenous people have been living in what we now call Canada for time immemorial, meaning that Indigenous communities have no stories of arriving here. They have always been here. There are many different First Nations along the River; each group is unique, with its own language or dialect, specific traditions, particular relationships with the landscape, stories, etc. The river has been used by Indigenous communities for thousands of years, and they have specialized technologies, traditions and celebrations related to the river, nature, and biodiversity. Hul'q'umi'num', Halq'eméylem, and hənqəmińəm are Indigenous language dialects spoken in the lower portion of the Fraser River. In Halqeméylem, the language dialect spoken in the upper portion of the lower Fraser, the word for river is Stolo. In hənqəmińəm, a language dialect spoken in the lower portion of the lower Fraser, the word for river is stalə w. Indigenous communities throughout BC speak other languages and dialects, and will have other names for the river. The Fraser River Discovery Centre is located on the traditional and unceded territory of the hənqəmińəm and Halqeméylem speaking peoples. Territory acknowledgement is one small part of Reconciliation. We ask you to take a moment to think of other ways you can participate in Reconciliation with Indigenous communities.

Program Overview:

Salmon undergo a laborious journey to return home to their natal stream. In this program, students will become familiar with salmon migration in the Lower Mainland. They will be introduced to the challenges of salmon during their journey home and how their physical structures are adapted to overcome such obstacles. One of the main challenges addressed is the blockages of the river, which prevent salmon from completing their migration. As such, tools known as fish passes are created to support salmon survival and are monitored through PIT tagging procedures.

The 70-minute program begins with an introductory presentation and is split into two activities:

1. Salmon Ladder Design Challenges
2. PIT Tagging Activity

Program Objectives

- Learn how salmon can physically return to their natal streams and why they do so.
- How the different features in rivers and streams support salmon's return journey.
- Who depends on the migration of salmon, and why the timing is so important.
- Why the flow of rivers may become blocked, and how it can have both positive and negative effects
- How fishways are used and why they are integral to salmon's health.
- What are PIT tags, and why are they used?

Helpful Vocabulary

- **Baffles: a** physical device that serves to redirect, check, or absorb flow
- **Fish Passage:** the ability of fish and other aquatic species to move freely through an aquatic system, including navigating human-made structures like dams and culverts, to access necessary habitats for their entire life cycle.
- **Interconnectedness**: a holistic worldview where everything in the universe is seen as linked and interdependent, including people, animals, plants, the land, the spirit world, and the Great Spirit.

- **Keystone Species:** species with significant influence in their natural environment – so much so that they are critical to maintaining the diversity and stability of an ecosystem
- **Migration**: the cyclical journey salmon make between fresh and saltwater environments to complete their life cycle.
- **PIT Tag:** a tiny, coded electronic marker injected into an animal that provides a unique, lifetime identification code.
- **Reciprocity**: a fundamental principle based on mutual exchange, respect, and a deep understanding of interconnectedness with all living things, including the land, community, and spirit
- **Riffles**: a rocky or shallow part of a stream or river with rough water.
- **River Basin:** the area of land from which all surface water—including precipitation, runoff, and groundwater—drains into a particular river and eventually flows to a single outlet, such as the sea or a large lake.
- **Sustainability**: the practice of meeting present needs without compromising the ability of future generations to meet their own needs, balancing environmental, economic, and social factors to ensure long-term health for both people and the planet.
- **Traditional Knowledge**: a living system of knowledge, know-how, skills, practices, and cultural expressions that are passed down from generation to generation within a community
- **Urban Development:** the process of building, changing, and improving towns and cities through the creation of new buildings, infrastructure, and public spaces
- **Water Contamination:** Water contamination occurs when substances pollute the water and make it unusable for cooking, drinking and other uses. Contamination can occur from agriculture, industrial chemicals, overflowing sewers and more.

In- class activities:

Here are some ideas to help prepare your class for the program, and to continue the learning back in the classroom.

<u>Pre-visit:</u>

1. Review the salmon life cycle, and what the journey looks like specifically for the Northwest Pacific Salmon
    a. https://www.youtube.com/watch?v=gFswGt7o_08

   b. Watch this beautiful video that illustrates the life cycle of salmon, told from the salmon's perspective. This video shows how salmon affects all aspects of life inside and outside the ater. It outlines Indigenous importance as well.
2. As a group, review the salmon spotting map and see some of the important natal streams for salmon in the Fraser River Basin
   a. https://psf.ca/salmonspotting/
3. Review the concept of fish ladders and passages
   a. https://www.youtube.com/watch?v=u2_w4SqDe5M
4. Review the concept of PIT tagging
   a. https://www.youtube.com/watch?v=PXK-potJHys

Post visit:

1. Review some of the Indigenous alternatives for fish passages
   a. https://www.youtube.com/watch?v=uPoKHOMlhZ0
2. Discuss Bottleneck projects in BC to help PIT tag salmon
   a. https://psf.ca/salmon-steward/breaking-the-bottlenecks/
3. Review the main challenges salmon face during their migration home. Incorporate these findings with this fun, active version of tag put on by Science World.
   a. https://www.scienceworld.ca/resource/impossible-salmon-tag/